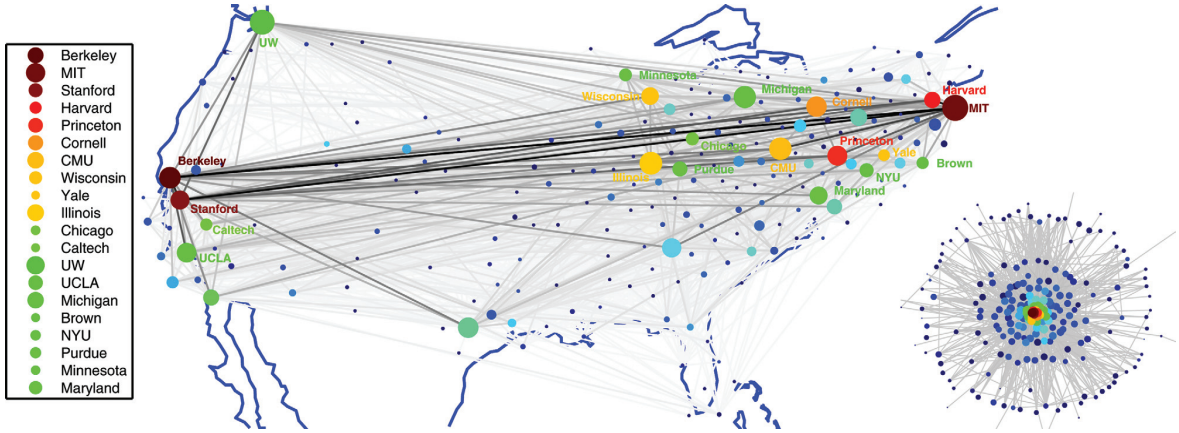

FIG. 1. (Color) Visualizations of a mathematics genealogy network.

Mathematical genealogy and department prestige

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The Mathematics Genealogy Project (http://www.genealogy.ams.org/) is a database of over 150 000 scholars with advanced degrees in mathematics and related fields. Entries include dissertation titles, adviser(s), graduation years, degree-granting institutions, and advisees. The MGP is popular among mathematicians, and it can be used to trace academic lineages through luminaries like Courant, Hilbert, and Wiener to historical predecessors such as Gauss, Euler, and even Kant. For example, MGP data was used recently to study the role of mentorship in protégé performance.[1]

We consider recent branches of this mathematical family tree by projecting the MGP data for degrees granted since 1973 onto a network whose nodes represent academic institutions in the United States. An individual who earns a doctorate from institution A (during the selected period) and later advises students at institution B is represented by a directed edge of unit weight pointing from B to A. The total edge weight from B to A counts the number of such advisers.

This network representation can be used to estimate the mathematical prestige of each university using various "centrality" scores[2] of the corresponding node (see Fig. 1). We represent "hub" and "authority" scores[3] using node size and color (red to blue), respectively. Institutions with high authority scores have high-valued hubs pointing to them, and high-valued hub nodes point to high-valued authorities. A university with a high authority score is a strong source of prestigious Ph.D. students and a university with a high hub score is a strong destination. In the legend of Fig. 1, we list the top 20 institutions in order of their authority scores.

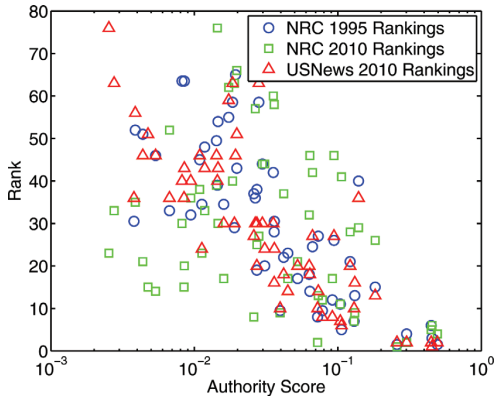

FIG. 2. (Color) Rankings versus authority scores.

We use a "geographically inspired" layout to balance node locations and node overlap. A Kamada-Kawai visualization[4] places the high-authority universities in the network's center.

In Fig. 2, we compare authority scores with three rankings of mathematics departments[5–7] for the 58 universities that appear in the top 40 of at least one of the rankings or have one of the top-40 authority scores. As expected, higher authority scores correlate with higher prestige (i.e., smaller rank numbers). However, scatter is obviously present, particularly with the 2010 National Research Council (NRC) rankings.

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